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ABSTRACT

This study of language development was intended to chart the developmental course of the spontaneous use of negatives and affirmatives by 1 1/2 - 3-year-olds in response to true or false statements concerning familiar objects, properties, and actions. Forty children, 18, 24, 30, and 36 months of age, were assessed for knowledge of the words used in the experiment and were then given a series of 48 statement verification tasks. Stimuli were simple existential statements of either true affirmatives ("That is a ball" about a ball), false affirmatives ("That is a car" about a ball), false negatives ("That is not a ball" about a ball), or true negatives ("That is not a car" about a ball). All sessions were videotaped and coded for affirmatives and negatives used by the children, for use of referent words (e.g. ball and car), and for nonverbal measures that distinguished comprehension strategies. Results suggested that by 2 1/2 years children manifest knowledge that language may fail to match reality. By 1 1/2 years, they distinguish appropriate true statements from other types. Relations in development between language as a communicative tool and as an object of cognition are discussed. (BD)

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The Development of Truth-Functional Language: $1\frac{1}{2}$ - 3 years*

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Negatives in speech often reflect important underlying mental capacities. They frequently depend on logical operations, such as in reasoning, but also involve, in their ordinary use, knowledge of another's point-of-view or beliefs, since they are utilized to deny what someone believes to be true (Wason 1972). Negatives appear very early in the speech of children (Bellugi 1967, Bloom 1970), yet investigations of either their logical functions or discourse contexts in the early years have been rare.[1] The present study concerns both these aspects of negation, and I will argue that the child from 1½ to 3 years of age is not only developing knowledge of the communicative functions of language, but has an early understanding of language as a semantic system that is truth-functional.

The present study was intended to chart the developmental course of the spontaneous use of negatives and affirmatives, especially, in a simplified version of the traditional sentence-verification paradigm with 1½ to 3 year olds, involving simple statements of variable truth-value (true or false) and assertive form (affirmative or negative) set in dialogues about familiar objects, properties, and actions.

There were 40 subjects, 5 male and 5 female eighteen month olds (mean age = 1;6(5)), twenty-four month olds (mean age = 2;0(5)), thirty-month olds (mean age = 2;6(5)), and thirty-six month olds (mean age = 3;0(5)). They were tested in the Developmental Psychology Laboratory at the University of Oxford.

Subjects were first presented with a word-production pretest to determine conventional usage or idiosyncratic variants of the 16 stimulus words (8 objects, 4 properties, 4 actions). A counterbalanced series of two-phase sentence-verification tasks then began: in each trial, E first

[1] Margaret Donaldson and her associates (1974, 1976) have previously shown that children as young as 3½ years of age can signal a mismatch between a statement and the situation it describes.

secured S's attention to the stimulus by either requesting it (primarily) or offering it. Then E made one of four types of statements about the stimulus: true-affirmative (TA: e.g. "That is a ball" about a ball), false-affirmative (FA: e.g. "That is a car" about a ball), false-negative (FN: e.g. "That is not a ball" about a ball), and true-negative (TN: e.g. "That is not a car" about a ball). Children received no special instructions. They did often spontaneously offer affirmatives, negatives, the name of the stimulus, asked questions, or made explicit logical oppositional responses such as "No, that's not a car, that's a ball." They also sometimes made False Responses, by misnaming the stimulus, for example, after they had previously shown both comprehension and production of the words involved.

All sessions were videotaped and transcribed into narrative form. Responses were coded for 6 dichotomous variables so that response morphology for the different statement-types could be compared. The coding results are presented on the handout in Tables 2-7. They are presented in percents rather than absolute frequency since, due to occasional fussing and early session termination, some subjects received fewer test items. The number of test statements for each age and statement-type appear in Table 1.

The different statement-types entail increasingly complex processing abilities for comprehension. True-affirmatives are correct assertions, whereas false-affirmatives are misnamings requiring correction. False negatives also require correction, but, in addition, involve understanding the speaker's negative as a denial, and oppositional in function. True negatives also necessitate understanding the negative as oppositional, but they are removed from the usual context of denial. No one is proposing that the statement denied by a true negative is the case, so an understanding of true negatives involves transcending the communicational context of negation and focusing on its logical function. Wason (1965, 1972), among many others, has provided ample evidence that such true-negative statements without

plausible contexts are in general harder to understand than false negatives. De Villiers & Flusberg (1975) have since demonstrated that children around 3 years of age are also sensitive to the communicative constraints of appropriateness on negative usage, understanding negatives in plausible contexts of denial before implausible negatives.

Several major shifts in response patterns occurred within the age range studied, and the general developmental picture portrays a differentiation of logical function for both "yes" and "no" to the different statement-types, and an emergent use of Explicit Logical Oppositions and False Responses.

Even though many of the 18 month olds are using only single words, they distinguish statements other than true-affirmatives by responding more often with negatives (Table 2), and more often with the word-for-the-stimulus.(Table 4). These same trends run through all the age groups. The use of the word-for-the-stimulus much more frequently for the false-negative than the true-affirmative, even by the youngest subjects, suggests that the child is oppositionally asserting the name rather than imitating it. Such a finding requires additional study, but suggests a primitive awareness of truth-conditions for at least true-affirmative and false-negative statements at an age near the onset of predication. At this point affirmatives are rare, and there are no Explicit Logical Oppositions or False Responses.

A group of important changes then becomes manifest. The use of the affirmative appears, and is differentiated to serve two distinct logical functions: for agreeing with true-affirmatives (primarily) and for opposing false-negatives (e.g. "Yes, ball"). The oppositional "yes" response is often coupled with the stimulus word, while the agreement "yes" is generally alone. The response to true-negatives is often one of inquisition: the aberrant

nature of this implausible kind of negative is recognized by many questions (Table 5). There are also fewer Explicit Logical Opposition responses to true-negatives than false-affirmatives even though the word mentioned is the same (Table 6). The general difficulty of the true-negative is also marked by fewer Explicit Logical Opposition responses in the older subjects. One measure in particular seems to distinguish this present group: their denial responses are sequential. They will often say "no" and only after a long pause name the stimulus. The youngest subjects rarely do both these things, and the older children usually combine them in Explicit Logical Opposition.

Later, children become quick to correct false statements, misnamings (false-affirmatives) being met with negatives generally, and false-negatives with either oppositional "yes"s or "no"s. It was very rare for any one subject to use both "yes"s and "no"s to oppose false-negatives. Explicit Logical Oppositions become a dominant response pattern and directly express a logical relation between the two names involved, conjoining denial and oppositional assertion (e.g. "No, it's not a dog, it's a cat"). The child not only understands that the statements are truth-functional, but assigns truth-values. These subjects also evidence reflective knowledge of correspondence rules of truth which relate language and reality in their use of False Responses, which are often marked by laughter, accentuated intonation, or loud voice (Table 7). They start to misname things, for example, as E does with false-affirmatives, and as both Premack (1976) and Collins (1968) argue, being able to say when a rule has been broken, and being able to break a rule, are both important criteria for ascriptions of rule-knowledge in cognition. Thirty and 36 month olds demonstrated both these abilities.

There is also evidence of rule-cognition for certain communicative constraints involving appropriateness conditions for negatives. The philosopher Grice (1975) has provided a pragmatic model for meaning in adult communication, where he proposes that there are certain conventions of cooperation for both interpreting the meaning of what others say and guiding our own utterances. Briefly, one can consider both the comprehension and production aspects of the maxims he proposes, and see whether they are involved in the language used and understood by children in this study.

(1) One of these is a maxim concerning QUALITY: "Do not say what you believe to be false," and incorporates the truth-functional feature of semantics already discussed. The younger children produce utterances in accord with this maxim, but the older children also manifest a reflective awareness of such a convention by explicitly violating it with False Responses. In comprehension, the younger children recognize that E is breaking this maxim with his false statements, and primarily implicitly correct E with the word-for-the-stimulus, whereas in the older children, explicit ("yes," "no," Explicit Logical Opposition) corrections are much more frequent.

(2) Another of Grice's maxims is one of QUANTITY: "Make your utterance only as informative as required." Consider Table 3 in this regard, where we can see that children of all the age groups use the name for the stimulus much more frequently to respond to the denial of that name (false-negatives) than to the assertion of it (true-affirmatives). In the former case, a mistake has been made by E and the child provides the apt information of correction. In the latter case, the stimulus has already been named, so the name is not an informative response and is less frequently used. Some of the older children even reply "Don't say that!" in reaction to the redundancy of the true-affirmative.

(3) And one of the maxims concerns RELATION: "Be relevant (to the previous verbal/material context)." The responses to true negatives are of particular interest here, since these statements are not, in this context, appropriate remarks about the stimulus which has been made the focus of attention. There is little possibility that the listener would have reason to believe, for example, that a car is a ball, though this is what a true-negative might deny. One might suspect that the proliferation of "no" responses to true-negatives represents comments on the irrelevancy of the statements, as "no" responses to false affirmatives are comments on their incorrectness. Though the children studied perhaps produced utterances in accord with this Relevancy maxim, their negative responses were equivocal as comments on the irrelevancy of E's true-negatives. The changing nature of the children's negative responses from the early single-word "no" discounts this interpretation. For example, some of the older children made consensual negative responses to true-negatives, like "it isn't" or "no, it isn't," which were unlike their denials of false-affirmatives, which were generally more like "no, it's a dog." It is difficult to tell whether this differentiated use of negatives to serve two distinct logical functions was available to the younger subjects, since their responses weren't as explicit as these examples. But the general difficulty with and challenge of the true negatives which children demonstrated at all ages in the study does suggest an early general constraint placed on negation comprehension by communicative relevancy.

An immediate temptation with this evidence for rule-cognition in two domains--logical and communicative--is to look upon them as parallel interpretations of the data. But what is required is some type of integrative model relating developments in the two domains, since at certain points, they intersect. Comprehending and assessing true-negatives requires concentrating on the logical structure of the statement and transcending the communicative constraints normally operative.

In conclusion, I want to suggest that one of our tasks in the study of language development lies in relating the acquisition of language as a social skill to the acquisition of language as a formal semantic system with a truth-functional logic. Much current research concerns the relationship between conceptual development and language acquisition (e.g. Clark 1973, Anglin 1975, Nelson 1975) and the development of social cognition as reflected in the elaboration of communication schemas (e.g. Bruner 1975 a, b; Bates 1976, Dore 1977). The present study reveals information about the child's developing conception of language itself, as a system relating to the world with logical structure.

Examples of Responses from Coding Categories (to various statement-types)

1) Yes: 18 months: headnod, "ya," "m-m" (fall-rise intonation)
24 months: (all of above)
30 months: (all of above), "yes, it is," "yes, she am"
36 months: (all of above), "yes, it is a car"

2) No: 18 months: headshake, "no"
24 months: (all of above), "no...(it's) apple," "t'isn't"
30 months: (all of above), "no, it's not her hair, that's her hair"
36 months: (all of above)

3) Word-for-stimulus:

18 months: "car"
24 months: "ball there," "that's hair"
30 months: "that's the big one," "he's drinking"
36 months: "this is a dog here," "she is sitting down"

4) Questions:

18 months: "huh?", "(what's)dat?", "car?"
24 months: "what's that?", "where is it?"
30 months: (all of above), "this biscuit, right?"
36 months: (all of above), "why isn't it the car?"

5) Explicit logical opposition:

18 months: not used
24 months: "no...../hair," "that mouth" (this is one response)
30 months: "that's not she mouth, that's she mouth"
36 months: "that's not the ball, that's the car"

6) False responses:

18 months: not used
24 months: "there the pussycat" (child points to dog, laugns)
30 months: "her nose" (child points to mouth), "her mouth" (child points to nose, laughs)
36 months: "there's a doggy" (child points to cat), "and there's a catty" (child points to dog)

Table 1: Number of statements presented at each age by statement-type

Age(months)	TA	FA	FN	TN
18	42	67	51	44
24	77	91	83	80
30	111	116	117	117
36	119	120	120	119

Table 2: % Statements with NO responses: statement-type by age

Age (months)	TA	FA	FN	TN
18	7	19	14	16
24	8	23	23	11
30	7	60	27	46
36	2	48	8	48

Table 3: % Statements with YES responses: statement-type by age

Age (months)	TA	FA	FN	TN
18	0	3	2	0
24	16	7	10	3
30	23	5	25	9
36	55	4	49	6

Table 4: % Statements with WORD-FOR-STIMULUS responses: statement-type by age

Age (months)	TA	FA	FN	TN
18	7	19	22	7
24	14	37	36	26
30	17	22	56	22
36	14	56	56	45

Table 5: % Statements with QUESTION responses: statement-type by age

Age (months)	TA	FA	FN	TN
18	0	3	0	2
24	1	9	5	13
30	0	4	3	5
36	0	3	4	5

Table 6: % Statements with EXPLICIT LOGICAL OPPOSITION responses: statement-type by age

Age (months)	TA	FA	FN	TN
18	--	0	--	0
24	--	8	--	4
30	--	12	--	3
36	--	21	--	5

Note: This is a possible response only for FAs and TNs.

Table 7: % Statements with FALSE RESPONSES: statement-type by age

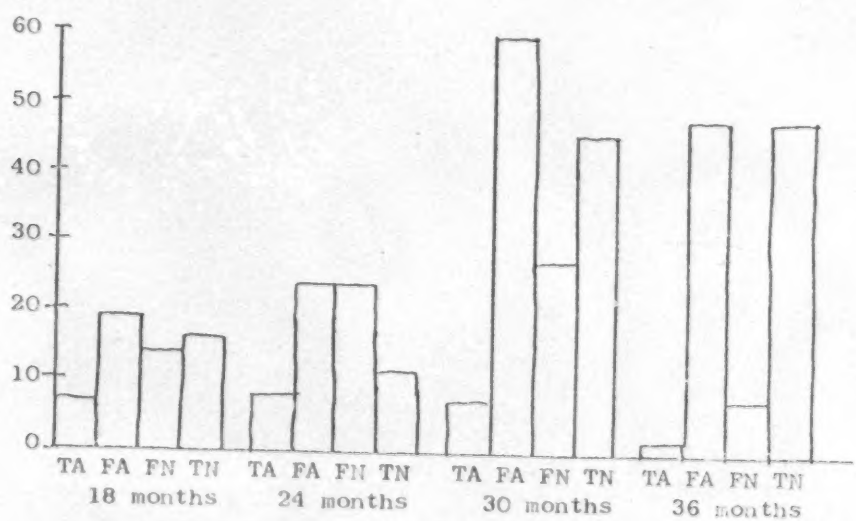
Age (months)	TA	FA	FN	TN
18	0	0	0	0
24	3	4	1	5
30	10	7	8	10
36	2	3	6	3

Graphic Representations of Tables 2-7

The figures show the percentage of statements with responses from the category concerned (ordinate) produced by subjects at different ages to different statement-types (abscissa). Results are discussed in the text.

Histogram 1:

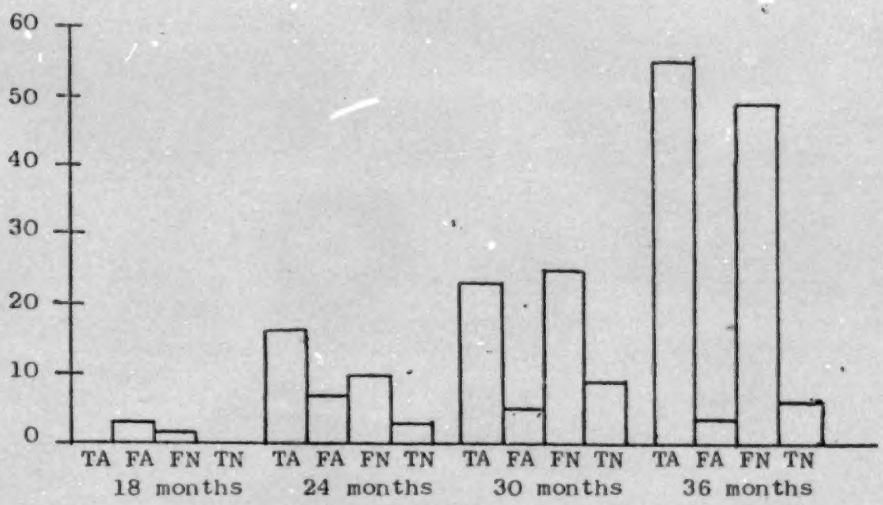
% Statements with NO responses: statement-type by age



The figures show the percentage of statements with responses from the category concerned (ordinate) produced by subjects at different ages to different statement-types (abscissa). Results are discussed in the text.

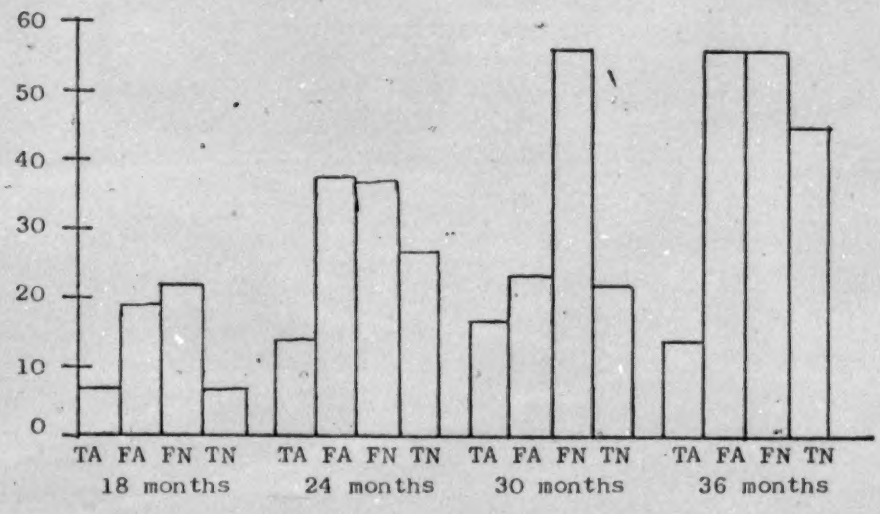
Histogram 2:

% Statements with YES responses: statement-type by age



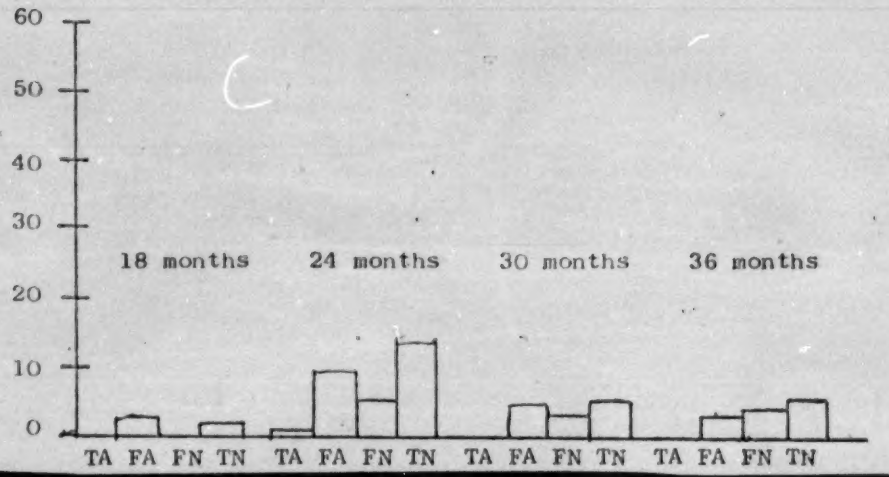
Histogram 3:

% Statements with WORD-FOR-STIMULUS responses: statement-type by age



Histogram 4:

% Statements with QUESTION responses: statement-type by age

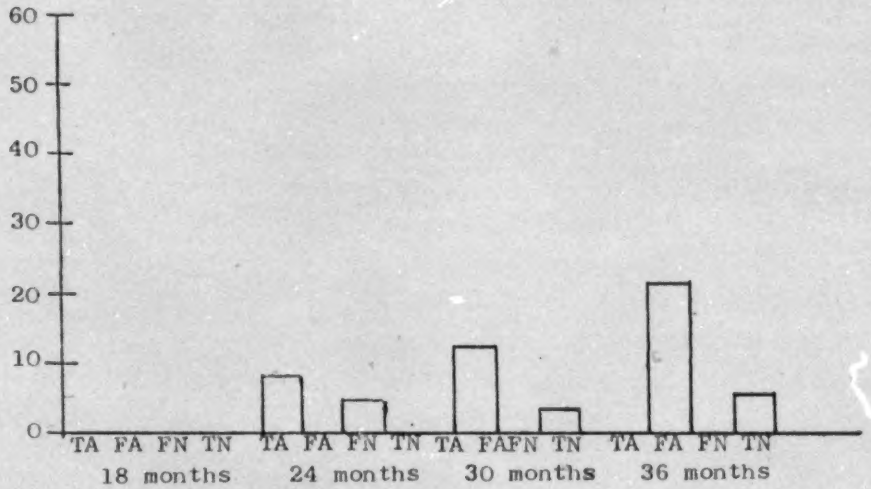


Graphic Representations of Tables 2-7

The figures show the percentage of statements with responses from the category concerned (ordinate) produced by subjects at different ages to different statement-types (abscissa). Results are discussed in the text.

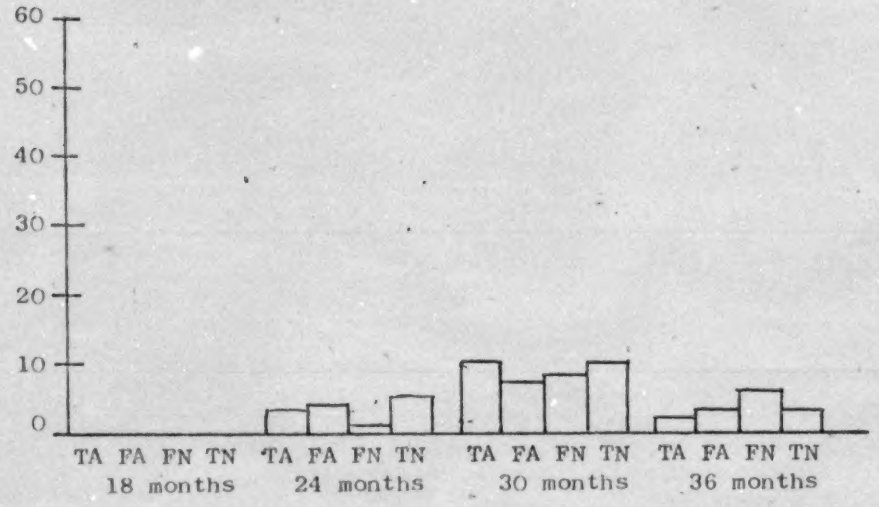
Histogram 5:

% Statements with EXPLICIT LOGICAL OPPOSITION responses: statement-type by age



Histogram 6:

% Statements with FALSE RESPONSES: statement-type by age



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